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TABLE

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DAIRY PRODUCTS

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This invention relates to an improvement in dairy products, more particularly a method for preparing cow's milk which is similar to human milk or products prepared therefrom.

Cow's milk is one of the infant's foods being usually employed as a substitute for human milk. The cow's milk is used not only as fresh milk in liquid form but also as processed milk such as condensed milk, milk powder and fermented milk. Cow's milk is, however, composed of not necessarily the same ingredients as those of human milk. Therefore, cow's milk can hardly be called a complete substitute for human milk.

Human milk has so far been considered as a complete foodstuff comprising almost sufficient nutritious components, and therefore it has often been used as a standard for the measurement of nutritive value of foodstuffs. For, infants usually grow remarkably well with only human milk given for several months. This is why human milk is regarded as a complete foodstuff.

Recent increases of women who do not like to nurse their own infants with their own milk for various reasons have made it more usual to nurse infants with cow's milk instead. But, as mentioned above, cow's milk is not a complete substitute for human milk in its nutrient source for infants. Such being the circumstances, there have been many attempts to make a human milk-like product from cow's milk. In these attempts, the most important problem is how to minimize difference between cow's milk and human milk in various components. Namely, differences between human milk and cow's milk in protein, fat, lactose, mineral substances, vitamins, bifidus factor, etc. in respect to their quantity, quality and content are to be minimized to the extent possible. For minimizing these differences, enrichment of cow's milk with whey proteins, vitamin F, β -lactose, etc. has been investigated and practised in recent years.

On the other hand, in the field of biochemistry, attention has recently been drawn to nucleic acid as a fundamental substance in life. In the course of the present inventors' study, various interesting facts have been found. Namely, there is a distinguishing difference in distribution of nucleic acid components between human milk and cow's milk. This fact was clarified by the present inventors' comparative study on acid soluble fractions of both milks. An example of the study is shown in the following table:

	Nucleotides*	Human milk (μ g percent)	Cow's milk (μ g percent)
5	Cytidine 5'-diphosphate choline (CDP-Choline).....	Trace	Trace
	Cytidine 5'-monophosphate (CMP).....	1, (80-1,800	297
	Adenosine 5'-monophosphate (AMP).....	90	
	3',5'-Adenosine cyclic monophosphate- (3',5'-AMP).....	21-24	138
10	Guanosine 5'-monophosphate (GMP).....	27-53	
	Uridine 5'-monophosphate (UMP).....	114-133	
	Uridine 5'-diphosphate N-acetyl-lactosa- mine (UX1).....	11	
	Uridine 5'-diphosphate N-acetyl-lactosa- mine fucose (UX3).....	160	
	Guanosine 5'-diphosphate mannose (GDPM).....	67-91	
15	Uridine 5'-diphosphate N-acetyl glucosa- mine plus Uridine 5'-diphosphate N- acetyl galactosamine (UDP-AG+UDP- AGal).....	260-361	
	Uridine 5'-diphosphate glucose plus Uri- dine 5'-diphosphate galactose (UDP-G+ UDP-Gal).....	67-84	
20	Guanosine 5'-diphosphate (GDP).....	34	
	Uridine 5'-diphosphate glucuronic acid plus Uridine 5'-diphosphate (UDP-GA+ UDP).....	127-218	
	Orotic acid.....		6,190

* (a) The nucleotides will be referred to hereinafter by the respective abbreviations shown in parentheses. (b) In human milk, there still can be found other kinds of nucleotide fractions, though they have not yet been identified.

As is clear from the above table, there are present numerous kinds of nucleotides in human milk, while most of the nucleotide fractions found in cow's milk is present as orotic acid which is regarded as a precursor of nucleic acid. It is interesting that such a remarkable difference is found between human milk and cow's milk in distribution of nucleic acid constituents, which are considered as a source of infant's nutrients.

Among these nucleotide fractions, UDP-AG, UX1 and UX3 can be found in human milk, which is also noteworthy. These nucleotide fractions have both UDP and various sugars, the later being known as the "bifidus factor" and are found in human milk. That is, the so-called "bifidus factor" is found in mother's milk in combined form with UDP. The "bifidus factor" causes a predominant occurrence of *Lactobacillus bifidus* in the intestinal tract of breast-fed infants, and therefore it is very important factor in protecting infants from bacterial intestinal diseases.

In the past nucleotides have been relatively unavailable, but they are now becoming easily obtainable as the result of improvements in microbiological or organic chemistry.

Namely, 5'-nucleotides may be industrially produced by the hydrolysis of nucleic acid by an enzyme system, e.g. microorganisms.

Combination of the aforesaid findings with the ready availability of 5'-nucleotides has led the present inventors to consider that the cow's milk can be converted into human milk-like product by the addition of nucleotides which are present in human milk but not in cow's milk. But, it has further been found by the present inventors that nucleotides are very unstable in cow's milk owing to the presence of phosphatases, e.g. phosphomonoesterase and pyrophosphatase, which catalyze the hydrolysis of nucleotides into nucleosides. And, the present inventors